# EFFECTS OF YOGIC PRACTICES ON IMMUNE SYSTEM FUNCTIONING OF SCHOOL GOING CHILDREN OF GWALIOR

A SHORT SYNOPSIS
Submitted
by

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## CERTIFICATE

I hereby declare that the synopsis **" Effects of Yogic Practices on Immune System Functioning of School Going Children of Gwalior"** being submitted in partial fulfillment of the requirement for the degree of Doctor of Philosophy in Yoga under the Department of Yogic Sciences, Lakshmibai National Institute of Physical Education (LNIPE), Gwalior, Madhya Pradesh, India during the academic year 2021-2022.

It is a bonafide record of original work carried out under the supervision of Dr. Nibu R. Krishna and the co-supervision of Dr. Indu Sharma has not been submitted in full or part to any other university or institute for a degree or diploma.

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## ABSTRACT

The present study aims to investigate the effects of a 12-week yogic intervention on immune system functioning among school-going children aged 10–12 years in Gwalior. With the rising importance of natural and preventive health strategies, yoga has emerged as a promising approach for enhancing physiological resilience and immune competence, especially among children. The study will purposively select 40 participants from schools in Gwalior, who will be randomly assigned into two equal groups: experimental, n=20 and control, n=20. The intervention group will undergo a structured yogic practice program over a period of 12 weeks, while the control group will maintain their regular routine.

The study will focus on six key immune parameters: T-cells, B-cells, and Natural Killer cells representing lymphocytic markers, and Neutrophils, Monocytes, and Macrophages representing phagocytic markers. Blood samples will be collected before and after the intervention and analyzed using standard immunological techniques, including flow cytometry and complete blood count with differential.

The objectives include assessing baseline immunity levels, evaluating intergroup post-intervention differences using ANCOVA, and analyzing intragroup variations across pre- and post-tests. Macrophage activity will be inferred indirectly via monocyte-related indices. Statistical tools like descriptive statistics, ANCOVA, and post-hoc comparisons will be employed for analysis.

This study is expected to provide scientific insights into the role of yogic practices in modulating immune cell functioning, thereby contributing to the growing body of evidence supporting integrative health approaches in the pediatric population. The findings may have implications for school-based wellness programs and preventive healthcare models.



**Keywords:** Yogic Practices, Immune System Functioning, School-going Children, Lymphocytes and Phagocytes, Flow Cytometry

# TABLE OF CONTENTS


**CHAPTER-1 INTRODUCTION** **1-5**

Statement of the Problem

Objectives of the Study

Research Questions

Delimitations

Limitations

Hypothesis

Significance of the Study

**CHAPTER-2 REVIEW OF RELATED LITERATURE** **6-8**

**CHAPTER-3 METHODOLOGY** **9-11**

Selection of Subjects

Selection of Criterion Variables

Procedure for Collection of Data

Experimental Treatment

Statistical Techniques

Expected Outcome

**Bibliography** **12-14**

# CHAPTER-I

# INTRODUCTION

The world is facing a global pandemic of severe acute respiratory syndrome caused by a novel 2019 coronavirus (SARS-CoV2). The diseases caused by this novel coronavirus was named COVID-19 (Coronavirus Disease 2019). The number of infected subjects have increased exponentially day by day and is accompanied by an increasing number of patients in critical status. It is evident that the immune system plays an important role in the response to SARS-CoV2 with significant differences among severe and non-severe patients (Shi et al., 2020). It is suggested that evaluating the selected immune parameters could help us to understand better the dynamics of immune system activation and probably to select the appropriate prognostic markers with respect to disease outcomes and expected complications.

**Concept of Immune System**

A person is said to be immune when he possesses "specific protective antibodies or cellular immunity as a result of previous infection or immunization or is so condition by such previous experience as to respond adequately to prevent infection and/or clinical illness following exposure to a specific infectious agent.

The specific defences may be discussed for convenience under the following heads.

1) Active immunity
    a) Humoral immunity
    b) Cellular immunity
    c) Combination above of the above
2) Passive immunity
    a) Normal human Ig
    b) Specific human Ig
    c) Animal antitoxins or antisera

Your immune system is a large network of organs, white blood cells, proteins (antibodies) and chemicals. This system works together to protect you from foreign invaders (bacteria, viruses, parasites, and fungi) that cause infection, illness and disease.

Yogic practice have been found effective in down regulation of pro-inflammatory workers. Yoga practices decreases the levels of pro inflammatory Cytokine IL-Beta, in both healthy individuals and in clinical populations.

The effect of yoga on IL-6 reveals less consistency. However, half of the research studies investigating the parameters indicated that Yoga practices decreases IL-6 levels with no directly opposing results.

Pullen et all (2010), found a very large effect (d=1.796) further supporting that Yoga can reduce IL-6 levels. Bower et all (2014) observed a large effect of yoga on immunity system indicating potential of yoga to reduce level of TNF-alpha. As per Gopal at all (2011) & Rajbhog et all (2015) research findings, there were significant increased in the levels of IL-10 in industrial workers with an elevated risk of sustained inform inflammation.

Keeping in mind the scientific research findings pertaining to Yogic Practice effect on functioning of Immunity system, the researcher felt a need to undertake an experimental research study entitled "**Effects of twelve weeks of Yogic Practices on Immune System functioning of School Going Children of Gwalior**"

## STATEMENT OF THE PROBLEM

The purpose of the study will be to find out the effects of 12 weeks of Yogic practices on immune system functioning among school going children of Gwalior.

## OBJECTIVES OF THE STUDY

In accordance with the problem statement developed by the researcher, the study aims to achieve the following objectives.

1. To assess the baseline levels of selected immune cell parameters—namely T-cells, B-cells, NK cells, Neutrophils, Monocytes, and Macrophages—in school-going children of Gwalior.
2. To compare the adjusted post-test, mean scores of the above immune parameters between the experimental group and the control group of school-going children in Gwalior, by using pre-test values as covariates.

3. To analyze the effect of the intervention on the immune cell parameters—T-cells, B-cells, NK cells, Neutrophils, Monocytes, and Macrophages—by comparing pre-test and post-test mean scores within the experimental group of school-going children in Gwalior.
4. To examine the natural variation or stability in immune cell parameters—T-cells, B-cells, NK cells, Neutrophils, Monocytes, and Macrophages—by comparing pre-test and post-test mean scores within the control group of school-going children in Gwalior.

## RESEARCH QUESTIONS

The aforementioned objectives will be accomplished through the exploration of the following research questions.

1. What is the effect of a yogic intervention on the levels of selected immune cell parameters—T-cells, B-cells, NK cells, Neutrophils, Monocytes, and Macrophages—in school-going children of Gwalior, compared to a control group?

2. How do the immune cell parameters (T-cells, B-cells, NK cells, Neutrophils, Monocytes, and Macrophages) change from pre-test to post-test within experimental and control groups of school-going children in Gwalior?

## DELIMITATIONS

The study will be delimited to: -

1. The present study will be delimited to school-going children aged 10 to 12 years, enrolled in selected educational institutions in Gwalior.
2. The study sample will be further delimited to 40 participants, comprising 20 children in the experimental group and 20 children in the control group.
3. The duration of the intervention program will be delimited to a total of 12 weeks.
4. The study will be further delimited to the assessment of the following dependent immune parameters:

    - **Lymphocytic markers**: T-cells, B-cells, and Natural Killer (NK) cells
    - **Phagocytic markers**: Neutrophils, Monocytes, and Macrophages

5. The intervention for the experimental group is delimited to a structured yogic training protocol comprising the following components:

    - Yogic Prayer
    - *Sukshma Vyayama* (Micro Exercises)
    - *Agnisar Kriya*
    - Selected *Asanas* (Postures)
    - *Pranayama* (Yogic Breathing Techniques)
    - *Dhyana* (Meditation)

## LIMITATIONS

Following points might be considered as limitations for the study: -

1. The limitations of the study will be the number of days selected students coming to the school for yogic training.
2. The dietary habits of selected subjects would vary from each other and hence will be one of the limitations.
3. The health status of selected subjects will be one of the limitations.

## HYPOTHESIS

Based on literature reviewed, experts' opinion, observation and experience of researcher and keeping the objectives of the study in concern, following hypotheses were formed: -

**$H_0$:** It is hypothesized that there will be no significant effects of Yogic Practices of twelve weeks duration on selected immune system functioning variables of school going children of Gwalior.

## SIGNIFICANCE OF THE STUDY

The results of the present study will contribute to the existing knowledge in the following ways:

1) The finding of research study will be helpful in understanding the impact of Yogic Practice on the functioning of immune system among school children.
2) The results of the study will be helpful in the form of preventive medicine for overcoming the problem of immunity among small children and old people.
3) The results of the study will also contribute to the G.D.P of the country by reducing the burden of large number of patients in hospitals by improving their immunity by yogic practices.
4) The results of the study will provide scientific base to Indian medical doctors to prescribe Yoga as a medicine to patients and hence will help in reducing medical expenses on each citizen of country.

# CHAPTER-II

# REVIEW OF RELATED LITERATURE

The researcher have searched various research studies being conducted to examine the effects of Yogic Practices on immune systems functioning of the body. The important research studies are presented below:

**Rajbhoj, P. H., Shete, S. U., Verma, A., & Bhogal, R. S. (2015).** in their study entitled __Effect of Yoga Module on Pro-Inflammatory and Anti-Inflammatory Cytokines in Industrial Workers of Lonavla: A Randomized Controlled Trial demonstrated that yoga practices could reduce pro-inflammatory cytokine and increase anti-inflammatory cytokine in industrial workers. Since, levels of inflammatory cytokines are important predictors of various cardio-pulmonary disorders; this study implied that yoga practices seem to be instrumental in decreasing systemic inflammation.

**Gopal, A., Mondal, S., Gandhi, A., Arora, S., & Bhattacharjee, J. (2011)** conducted a preliminary study on Effect of integrated yoga practices on immune responses in examination stress. The study was carried out on sixty first-year MBBS students randomly assigned to yoga group and control group (30 each). In the yoga group, no significant difference was observed in physiological parameters during the examination stress, whereas in the control group, a significant increase was observed. Likewise, the indicators of psychological stress showed highly significant difference in control group compared with significant difference in yoga group. During the examination, the increase in serum cortical and decrease in serum IFN-γ in yoga group was less significant ($P<0.01$) than in the control group ($P<0.001$). Both the groups demonstrated an increase in serum IL-4 levels, the changes being insignificant for the duration of the study.

**Barnes and Nagarker (1989)** in their study entitled __Yoga Education Scholastic Achievement‖ found a positive effect of yogic practices on academic achievements. This study was conducted on th 40 students selected from school registers of VIII standard (age group 13-15 years) on the basis of their willingness to participate in yoga training camp for four months. The schedule consisted of asana, Pranayama and Kriyas for 2 hours everyday. For data collection Scholastic

Aptitude Test and Non- verbal Test were administered before and after yoga training camp. The results showed a significant positive effect of yoga training camp on scholastic aptitude as well as on intelligence.

**Schell, et.al. (1994)** conducted a study on physiological and psychological effects of Hatha – Yoga exercise in healthy women. They measured heart rate, blood pressure, the hormones cortisol, prolactin and growth hormone and certain psychological parameters in a yoga practicing group and a control group of young female volunteers prior and after the experimental period. There were no substantial differences between the groups concerning endocrine parameters and blood pressure. The heart rate was significantly different in yoga group having a significant decrease in heart rate during the yoga practice. In the personality inventory the yoga group showed markedly higher scores in life satisfaction and lower scores in excitability, aggressiveness, openness, emotionality and somatic complaints. Significant differences could also be observed concerning coping with stress and mood at the end of the experiment. The yoga group had significant higher scores in high spirits and extra variedness.

**Harinath, et. al., (2004)** had conducted the study on effects of Hatha yoga and Omkar meditation on cardio respiratory performance, psychologic profile, and melatonin secretion. Thirty healthy men in the age group of 25-35 years volunteered for the study. They were randomly divided in two groups of 15 each. Group 1 subjects served as controls and performed body flexibility exercises for 40 minutes and slow running for 20 minutes during morning hours and played games for 60 minutes during evening hours daily for 3 months. Group 2 subjects practiced selected yogic asanas (postures) for 45 minutes and pranayama for 15 minutes during the morning, whereas during the evening hours these subjects performed preparatory yogic postures for 15 minutes, pranayama for 15 minutes, and meditation for 30 minutes daily, for 3 months. Orthostatic tolerance, heart rate, blood pressure, respiratory rate, dynamic lung function (such as forced vital capacity, forced expiratory volume in 1 second, forced expiratory volume percentage, peak expiratory flow rate, and maximum voluntary ventilation), and psychologic profile were measured before and after 3 months of yogic practices. Serial blood samples were drawn at various time intervals to study effects of these yogic practices and Omkar meditation on melatonin levels. Yogic practices for 3 months resulted in an improvement in cardio respiratory performance and psychological profile. The plasma melatonin also showed an increase after three months of yogic practices. The systolic

blood pressure, diastolic blood pressure, mean arterial pressure, and orthostatic tolerance did not show any significant correlation with plasma melatonin. However, the maximum night time melatonin levels in yoga group showed a significant correlation ($r = 0.71$, $p < 0.05$) with well-being score. These observations suggest that yogic practices can be used as psycho physiologic stimuli to increase endogenous secretion of melatonin, which, in turn, might be responsible for improved sense of well-being.

# CHAPTER-III

# METHODOLOGY

The present chapter comprises of selection of subjects, criterion variables, procedure for collection of data, training schedule for Yogic Practices and Statistical technique to be applied for finding out effects of 12 weeks yogic practices on Immune system functioning.

## SELECTION OF SUBJECTS

To test the hypotheses of the study, a total of 40 school-going children aged between 10 and 12 years will be purposively selected from schools in Gwalior. These participants will then be randomly assigned into two groups: 20 in the experimental group and 20 in the control group. Prior to the commencement of the intervention, informed consent will be obtained from both the school principal and the parents or guardians of the selected participants.

## SELECTION OF CRITERION VARIABLES

The following shall be the criterion variables for the study:

| **S. No.** | **Category** | **Variable** | **Tool/Instrument/Test Used** | **Unit of Measurement** |
|---|---|---|---|---|
| 1 | Lymphocytes | T-cells | Flow Cytometry / Immunophenotyping | Cells/µL (microliter) |
| 2 | | B-cells | Flow Cytometry / Immunophenotyping | Cells/µL (microliter) |
| 3 | | NK cells | Flow Cytometry / Immunophenotyping | Cells/µL (microliter) |
| 4 | Phagocytes | Neutrophils | Complete Blood Count (CBC) with Differential | Cells/µL (microliter) or % |
| 5 | | Monocytes | Complete Blood Count (CBC) with Differential | Cells/µL (microliter) or % |
| 6 | | Macrophages | Indirect Estimation from Monocyte | Descriptive / |

| | | | | |
|---|---|---|---|---|
| | | | Count / Tissue Biopsy (if applicable) | Qualitative / Inferred |

## PROCEDURE FOR COLLECTION OF DATA

The assessment of immune parameters will be conducted in two phases: **pre-test** and **post-test**, for both the experimental and control groups.

- Blood samples will be collected from each participant by a qualified phlebotomist under sterile laboratory conditions.
- The following **lymphocyte subsets**—**T-cells, B-cells, and NK cells**—will be assessed using **flow cytometry** with fluorescently tagged monoclonal antibodies.
- The **phagocytic cells**—**Neutrophils and Monocytes**—will be evaluated using a **Complete Blood Count (CBC) with differential leukocyte analysis**.
- **Macrophage activity** will be **inferred indirectly** through monocyte differentiation markers or cytokine expression levels where applicable.
- All blood samples will be processed in Department of Virology of GRMC Gwalior, and results will be documented in standardized datasheets for analysis.

## EXPERIMENTAL TREATMENT

The experimental treatment shall be carried out for the period of twelve weeks duration after conducting initial test of subjects in control group and in experimental group on immunity parameters. The following shall be the schedule of Yogic practices for a period of 12 weeks duration:

## STATISTICAL TECHNIQUES

1. To characterize the level of Immunity Parameters of School going children of Gwalior, Descriptive Statistics will be used.
2. To compare adjusted mean scores of Immunity Parameters of Experimental and control group of School going children of Gwalior by considering the pre-score of immunity parameters as covariate, One Way ANCOVA will be used.
3. To compare mean scores of Immunity Parameters of School going children of Gwalior at Pre-test and Post-test stages of Experimental Group and Control group, post-hoc test will be used.

## EXPECTED OUTCOMES

This study is expected to provide scientific insights into the role of yogic practices in modulating immune cell functioning, thereby contributing to the growing body of evidence supporting integrative health approaches in the pediatric population. The findings may have implications for school-based wellness programs and preventive healthcare models.

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